A propos du centre ou de la direction fonctionnelle

The Inria Lille - Nord Europe Research Centre was founded in 2008 and employs a staff of 360, including 300 scientists working in fifteen research teams. Recognised for its outstanding contribution to the socio-economic development of the Hauts-de-France region, the Inria Lille - Nord Europe Research Centre undertakes research in the field of computer science in collaboration with a range of academic, institutional and industrial partners.

The strategy of the Centre is to develop an internationally renowned centre of excellence with a significant impact on the City of Lille and its surrounding area. It works to achieve this by pursuing a range of ambitious research projects in such fields of computer science as the intelligence of data and adaptive software systems. Building on the synergies between research and industry, Inria is a major contributor to skills and technology transfer in the field of computer science.

Contexte et atouts du poste

The selected PhD student will be mainly based in Lille in the MAGNET team but will also frequently visit the COMETE team. The main objective of the COMETE team is to develop principled approaches to privacy protection to guide the design of sanitization mechanisms in realistic scenarios. Similarly, the main objective of the MAGNET team is to develop ethically acceptable machine learning algorithms focusing on privacy, federated learning, and fairness and to empower end users of artificial intelligence.

Moreover, the position is part of FedMalin, a large-scale research initiative involving 10 Inria teams across 6 different Inria centers, 22 researchers, 16 PhD students (6 to be hired), 5 postdocs (3 to be hired) and 7 engineers (6 to be hired). The recruited person will have the opportunity to collaborate with other participants of this initiative and take advantage of the scientific emulation it will create.

The PhD candidate will be under the supervision of Aurélien Bellet, who has been working on federated machine learning for several years, Catuscia Palamidessi, who is a specialist in privacy preserving and fair machine learning, and Michaël Perrot, whose main research focus is on the problem of fair machine learning.

Mission confiée

Machine Learning is now used in digital assistants, for medical diagnosis, for autonomous vehicles, ... Its success can be explained by the good performances of learned models, sometimes reaching human-level capabilities. However, simply being accurate is not sufficient if these models are to be largely deployed and the notion of fairness, and more largely of trustworthiness, has to be considered as soon as humans are involved in the loop. For example, a model used for medical diagnosis or an automated hiring process should not be biased against subgroups of the population. A recent trend in Machine Learning is thus to propose approaches to learn models that are as accurate as possible, while satisfying some level of fairness, that is that do not unjustly discriminate against some individuals or subgroups of the population.

Most Machine Learning algorithms were developed in environments where the data can be centralized and easily accessed. However, in many use-cases, data is naturally decentralized and should not be publicly disclosed. For example, medical data is collected and stored by different hospitals or crowdsensed data is generated by personal devices. This raises new challenges and, in this context, Federated Learning emerged as a paradigm where a set of entities collaborate to collectively learn models without explicitly sharing their data. The main objective being to reach levels of utility on par with the centralized setting where all the data is owned by a single entity.

While fairness has been widely studied in the centralized setting, the decentralized nature of the data in Federated Learning raises new challenges. For example, the fairness level of the models becomes difficult to measure as each data holding entity only has a partial view of the world. Similarly, as the different entities collaborate, they expect fair rewards that are proportional to their implication. The goal of this PhD is to study fairness in Federated Learning from both a theoretical and an applied point of view. It involves formally understanding the various trade-offs that may arise due to decentralization and proposing sound algorithms able to learn models that are guaranteed to be fair.

Principalités activités

1. Review and follow the existing literature on Fairness and Federated Learning
2. Theoretically and empirically study the Fairness trade-offs inherent to Federated Learning and related to the decentralized nature of the data
3. Propose concrete approaches to measure and enforce various notions of Fairness in Federated Learning, and validate them on real datasets
4. Publish and present results in top machine learning conferences and journals

Compétences

A good candidate will have the following skills:

Informations générales

- Thème/Domaine : Optimisation, apprentissage et méthodes statistiques
- Ville : Villeneuve d’Ascq
- Centre Inria : Lille - Nord Europe
- Date de prise de fonction souhaitée : 2022-04-01
- Durée de contrat : 3 ans
- Date limite pour postuler : 2022-10-31

Contacts

- Equipe Inria : MAGNET
- Directeur de thèse : Michaël Perrot (michael.perrot@inria.fr)

A propos d’Inria

Inria est l’institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 200 équipes-projets, en général communes avec des partenaires académiques, impliquent plus de 3500 scientifiques pour relever les défis du numérique, souvent à l’interface d’autres disciplines. L’institut fait appel à de nombreux talents dans plus d’une quarantaine de métiers différents. 500 personnes d’appui à la recherche et à l’innovation contribuent à faire émerger et grandir des projets scientifiques ou entrepreneuriaux qui impactent le monde.

Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 180 start-ups. L’institut s’efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l’économie.

L’essentiel pour réussir

A successful candidate will

- Collaborate in the team and where applicable with external researchers and engineers
- Organize work efficiently and make a good balance between the several priorities
- Report regularly

Consignes pour postuler

Sécurité défense :

Ce poste est susceptible d’être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L’autorisation d’accès à une zone est délivrée par le chef d’établissement, après avis ministériel favorable, tel que défini dans l’arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l’annulation du recrutement.

Politique de recrutement :

Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.

Attention : Les candidatures doivent être déposées en ligne sur le site Inria ; la soumission des candidatures adressées par d’autres canaux n’est pas garantie.
- A good command of English
- A strong background in mathematics
- A good knowledge of machine learning, statistics and algorithms
- Some experience with implementation and experimentation
- Preferably some knowledge on either fairness or federated learning (or both)

Please follow the instructions given in https://team.inria.fr/magnet/how-to-apply/ to set up your application file.

**Avantages**

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

**Rémunération**

1st and 2nd year: 2051 € Gross monthly salary (before taxes)

3rd year: 2158 € gross monthly salary (before taxes)